

CLAIMS

What is claimed is:

- 1 1. A system, comprising:  
2 a set of transceivers to couple a set of optical channels; and  
3 an integrated optical circuit coupled to receive the set of optical  
4 channels from the set of transceivers, the integrated optical circuit having:  
5 a set of optical amplifiers formed in the integrated optical circuit;  
6 and  
7 a set of arrayed waveguide gratings (AWG) formed in the  
8 integrated optical circuit and coupled to the set of optical amplifiers.
- 1 2. The system of claim 1, further comprising a set of optical fibers to couple the  
2 set of transceivers to the integrated optical circuit.
- 1 3. The system of claim 1, wherein the set of optical amplifiers comprises a set of  
2 waveguide elements to combine pump light and optical signal light.
- 1 4. The system of claim 3, wherein the set of optical amplifiers includes a set of  
2 gain portions coupled to the set of waveguide elements.
- 1 5. The system of claim 4, wherein the set of optical signals includes a multiple  
2 channel optical signal and the AWG is coupled to demultiplex the multiple channel  
3 optical signal into a set of single channel optical signals.
- 1 6. The system of claim 4, wherein the set of optical signals includes a set of single  
2 channel optical signals and the AWG is coupled to multiplex the set of single channel  
3 optical signals into a multiple channel optical signal.

1 7. An apparatus, comprising:

2 an integrated optical circuit having:

3 a set of optical amplifiers formed in the integrated optical circuit;

4 and

5 an arrayed waveguide grating (AWG) formed in the integrated

6 optical circuit and coupled to the set of optical amplifiers.

1 8. The apparatus of claim 7, wherein the AWG is coupled to a set of optical  
2 amplifiers inputs via a set of input waveguide elements.

1 9. The apparatus of claim 8, wherein the AWG is coupled to a set of optical  
2 amplifier outputs via a set of output waveguide elements.

1 10. The apparatus of claim 7, wherein the set of optical amplifiers includes a set of  
2 gain portions coupled to the set of waveguide elements.

1 11. An apparatus, comprising:

2 an integrated optical circuit having:

3 a first arrayed waveguide grating (AWG) and a second AWG  
4 formed in the integrated optical circuit; and

5 a set of optical amplifiers formed in the integrated optical circuit  
6 and coupled between the first and second AWGs.

1 12. The apparatus of claim 11, wherein the first and second AWGs are coupled to  
2 the set of optical amplifiers via a set of waveguide elements.

1 13. The apparatus of claim 12, wherein the set of optical amplifiers is coupled to  
2 combine pump light and optical signal light.

1 14. An apparatus, comprising:  
2 an integrated optical circuit having:  
3 an arrayed waveguide grating (AWG) formed in the integrated  
4 optical circuit having an output set of waveguide elements;  
5 a set of optical amplifiers formed in the integrated optical circuit;  
6 and coupled to the output waveguide elements.

1 15. The apparatus of claim 14, wherein each optical amplifier in the set of optical  
2 amplifier has a predetermined length to compensate for non-uniform gain spectrum of  
3 the AWG.

1 16. The apparatus of claim 15, wherein the set of optical amplifiers is coupled to  
2 combine pump light and optical signal light.

1 17. The apparatus of claim 16, further comprising a pump interface to couple pump  
2 light to the set of optical amplifiers.

1 18. The apparatus of claim 16, further comprising an optical signal interface to  
2 couple optical signal light to the AWG.

1 19. An apparatus, comprising:  
2 an integrated optical circuit having:  
3 an arrayed waveguide grating (AWG) formed in the integrated  
4 optical circuit having an input set of waveguide elements;  
5 a set of optical amplifiers formed in the integrated optical circuit;  
6 and coupled to the input waveguide elements.

1 20. The apparatus of claim 19, wherein the set of optical amplifiers is coupled to  
2 combine pump light and optical signal light.

1 21. The apparatus of claim 19, wherein the AWG includes a waveguide array,  
2 wherein a shape and width of each waveguide in the waveguide array is varied to  
3 produce a varied light distribution a an AWG output waveguide array.

1 22. A method, comprising:  
2 forming at least one multiplexer/demultiplexer in a single integrated  
3 optical circuit; and  
4 forming at least one optical amplifier in the single integrated optical  
5 circuit and coupling an output of the optical amplifier to the an input of the  
6 multiplexer/demultiplexer via a waveguide formed in the integrated optical circuit.

1 23. The method of claim 22, further comprising forming a second waveguide in the  
2 single integrated optical circuit to couple an optical amplifier signal input to a signal  
3 coupler on the single integrated optical circuit.

24. The method of claim 22, further comprising forming a second waveguide in the single integrated optical circuit to couple an optical amplifier pump input to a pump coupler on the single integrated optical circuit.

25. The method of claim 22, wherein forming a multiplexer/demultiplexer in a single integrated optical circuit comprises forming an arrayed waveguide grating (AWG) in the single integrated optical circuit.

26. The method of claim 22, wherein forming an optical amplifier in a single integrated optical circuit comprises doping rare-earth ions in a waveguide formed in the single integrated optical circuit.

27. The method of claim 26, wherein sputtering rare-earth ions in a waveguide formed in the single integrated optical circuit comprises sputtering erbium ions or praseodymium ions in a waveguide formed in the single integrated optical circuit.

28. A method, comprising:  
forming at least one multiplexer/demultiplexer in a single integrated optical circuit; and  
forming at least one optical amplifier in the single integrated optical circuit and coupling an input of the optical amplifier to the an output of the multiplexer/demultiplexer via a waveguide element formed in the integrated optical circuit.

29. The method of claim 28, wherein forming a multiplexer/demultiplexer in a single integrated optical circuit comprises forming an arrayed waveguide grating (AWG) in the single integrated optical circuit.

1 30. The method of claim 28, wherein forming at least one optical amplifier in a  
2 single integrated optical circuit comprises doping rare-earth ions in at least one  
3 waveguide element formed in the single integrated optical circuit.

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